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Enhancing AMOC Observing Strategies and Interpreting Observations through Process

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The spatial scales of key AMOC processes are typically larger than the deformation radius and, thus, its variations are likely governed by lower order dynamics that acts on complex bathymetry. It is expected that a large portion of observed AMOC variations can be modeled and explained in simple models. In this study, we employ a 3-layer process model with realistic bathymetry and wind-stress forcing to simulate AMOC variations. The model exhibits excellent agreement with observational data from the RAPID array at 27°N and ECCO4 ocean state estimate across latitudes. Topography, particularly the mid-Atlantic Ridge and continental slope, plays a crucial role in shaping AMOC responses to atmospheric forcing and influencing the propagation pathways of AMOC variability. By comparing process model simulations with ECCO4 and satellite-observed ocean bottom pressure, we identify key processes responsible for observed AMOC variations and main propagation pathways and examine contributions from barotropic and baroclinic processes. The simplicity and transparency of dynamics make process models particularly useful for helping to interpret observed AMOC changes and planning future observing strategies.

Topic

Observational priorities –what should we measure?

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